

## Claims

1. Device for dispensing shaped objects singly which may be connected by one of its ends to a packaging container for said objects and optionally by the other end to a cap for receiving for the singly dispensed objects, consisting of two parts which mate coaxially with each other, one part, the female part, being fixed and the other, the male part, rotatable, characterised in that, in the sequence of travel of the objects to be dispensed singly from the region where they are packaged in bulk,

a) the fixed female part (1) which constitutes the upstream part for entry into the device of the bulk objects to be dispensed, comprises:

a1) an external main cylindrical casing (5) which is open at its upstream end (6) and downstream end (7),

a2) an internal casing (8), which is coaxial with the external casing (5), closed at its upstream part (9) and open at its downstream part (10), of which the distance from the external casing (5) is at least equal to the smallest dimension of the object to be dispensed to create a free space (11) for the orientation and organised movement of said objects from upstream to downstream,

a3) a first plane (12), which is close to the upstream end (6), connects the coaxial external casing (5) and internal casing (8) perpendicularly to said axis, is shaped as a circular sector of angle  $\alpha$ , is provided with an opening shaped as an arc of a circle (13), and leaves the free space (11) for orientation and organised movement clear,

a4) a second plane (14), which is placed between the first plane (12) and the downstream end (7), connects the coaxial external casing (5) and internal casing (8) perpendicularly to the axis, is shaped as a circular sector of angle  $\beta$ , is provided with at least one opening (15) or (16) dimensioned for the passage downstream singly of the objects present in the free space (11) for orientation and organised movement,

a5) between the second plane (14) and the downstream end (7) of the female part, at least one chute mounted on the at least one opening (15) or (16) of the second plane (14), to allow storage in a queue of stacked objects to be dispensed which originate from the free space (11) for orientation and organised movement, this at least one chute being delimited by the coaxial external casing (5) and internal casing (8) and by two planar lateral walls (19, 21) or (20, 22) by a chute connecting said casings and extending to the downstream end of said female part, the at least one chute being provided at its downstream end with an opening dimensioned for the passage of a single object to be dispensed,

b) the rotatable male part (2) which constitutes the downstream part for discharge of the dispensed objects from the device comprises:

b1) a base platform (23) shaped as a circular disk which forms a stop for the external cylindrical casing (5) of the female part, this platform being provided with an opening (25) dimensioned for the passage of an object delivered by the at least one chute,

b2) a casing (26) coaxial with the base platform (23) to which it is connected, having substantially the shape of the internal casing (8) of the female part (1) of the device, in which it inserts itself to allow the rotation of the male part relative to the female part of the device,

b3) a means (29) for guidance in rotation connected to and perpendicular to the base platform (23), the free end (30) of which is designed to insert itself into the opening shaped as an arc of a circle (13) of the first plane (12) of the female part,

b4) a crown segment (31), mounted on the means for guidance in rotation (29), which moves freely, when the male part (2) of the device rotates, between the two planes (12) and (14) of the female part of the device and which blocks the inlet opening (17) or (18) of the at least one chute, at least partially and at the end of its travel, in at least one direction of rotation of the male part,

b5) a guide means (33) for the object to be dispensed placed in the axis of the dimensioned opening (25) of the base platform (23) on the external wall of the casing (26) coaxial with the platform (23) of the male part.

2. Dispensing device according to claim 1, characterised in that the external cylindrical casing (5), open at its upstream end (9) and downstream end (10), is equipped on its external surface with a ring (34) which is connected to said casing and acts as a stop.

3. Device according to either claim 1 or claim 2 characterised in that the internal casing (8), coaxial with the first casing (5), has geometry generated by revolution of a cylindrical, cylindrical/truncated cone shaped, cylindrical/conical, truncated cone shaped, conical or parabolic type.

4. Device according to claim 3 characterised in that the upstream part (9) of the internal casing (8) is of a truncated cone shaped, conical, hemispherical or parabolic type.

5. Device according to any one of claims 1 to 4 characterised in that the free space (11) created between the external casing (5) and the internal casing (8) reaches a minimum thickness in the most downstream part that is very slightly greater than the smallest dimension of the object to be dispensed.

6. Device according to at least one of claims 1 to 5 characterised in that the angle  $\alpha$ , in degrees, at the top of the circular sector of the first plane (12), is a resultant of the diameters of the shaped objects to be dispensed and the female part.

7. Device according to at least one of claims 1 to 6 characterised in that the angle  $\beta$ , in degrees, at the top of the circular sector of the second plane (14), is a resultant of the diameters of the shaped objects to be dispensed and the female part.

8. Device according to at least one of claims 1 to 7 characterised in that the second circular sector of angle  $\beta$  of the second plane (14) occupies a position opposite the first circular sector of angle  $\alpha$  of the first plane (12).

9. Device according to at least one of claims 1 to 8 characterised in that the total of angles  $\alpha$  and  $\beta$  of the two circular sectors is at most 360 degrees.

10. Device according to at least one of claims 1 to 9 characterised in that the at least one opening (15) or (16) has a section that is greater than the smallest section of the shaped objects to be dispensed but such that two shaped objects to be dispensed cannot pass through it and preferably a section that is very slightly greater than said smallest section of said objects.

11. Device according to at least one of claims 1 to 10 characterised in that the planar lateral walls (19, 21) or (20, 22) of the at least one chute (17 or 18) are parallel to each other.

12. Device according to at least one of claims 1 to 10 characterised in that the planar lateral walls (19, 21) or (20, 22) of the at least one chute (17 or 18) are concurrent with each other from upstream to downstream of the at least one chute.

13. Device according to at least one of claims 1 to 12 characterised in that the device comprises two chutes (17) and (18).

14. Device according to at least one of claims 1 to 13 characterised in that the second plane (14), placed between the first plane (12) and the downstream end (7), connecting the coaxial external casing (5) and internal casing (8) perpendicularly to said axis, in the shape of a circular sector of angle  $\beta$ , is provided with two openings (15) and (16) dimensioned for the passage downstream singly of objects present in the free space (11) for orientation and organised movement, these two openings being mutually spaced by an angle  $\gamma$ .

15. Device according to at least one of claims 1 to 14 characterised in that the two openings (15) and (16) in the second plane (14) are mutually spaced by the angle  $\gamma$ , delimited by the two sides of said angle passing through the centre of symmetry of each of these two openings (15) and (16), this angle  $\gamma$  being chosen from the range of angular values of

approximately  $0^\circ$  when the two openings are juxtaposed up to  $180^\circ$  when the openings are diametrically opposed, regardless of the direction of rotation of the male part (2).

16. Device according to at least one of claims 1 to 15 characterised in that the rotatable male part comprises a crown segment (31) mounted on the guide means (29) which, during the rotation of the male part (2), moves freely between the two planes (12) and (14) of the female part and blocks the upstream opening of the chutes (17) and (18), at least partially and alternately at the end of its travel.

17. Device according to at least one of claims 1 to 16 characterised in that the casing (20), coaxial with the base platform (23), has a geometry generated by revolution that is cylindrical, cylindrical/truncated cone shaped, cylindrical/conical, truncated cone shaped, conical or parabolic.

18. Device according to at least one of claims 1 to 17 characterised in that the free end (30) of the means for guidance in rotation (29), which moves in the opening shaped as an arc of a circle (13) of the first plane (12) of the female part, restricts the rotational angle in either direction by a stop at each end of said opening shaped as an arc of a circle (13) for making the opening (25) of the platform congruent with the downstream end of the at least one chute.

19. Device according to claim 18 characterised in that the rotational angle of the male part, from one end stop to the other end stop, has the angular value  $\gamma$ .

20. Device according to claim 18 characterised in that the free end (30) of the means for guidance in rotation (29) that emerges from the opening shaped as an arc of a circle (13) acts as an agitator for the shaped objects, packaged in bulk in the packaging region.

21. Device according to at least one of claims 1 to 20 characterised in that the ends of the crown segment (31) mounted on the means for guidance in rotation (29) are bevelled.

22. Device according to at least one of claims 1 to 21 characterised in that the guide means (33) mounted on the external wall of the casing (26) coaxial with the platform (23) has a semi-polygonal, semi-circular or semi-elliptical plane.

23. Closed unit for packaging and dispensing shaped objects singly comprising the device according to claims 1 to 22 connected and mounted by one of its ends on the open end of a bulk packaging container for the shaped objects to be dispensed formed by a casing and a cap and connected by its other end to a cap that is capable of rotating the moving male part (2) of said device in either direction.

24. Closed packaging and dispensing unit according to claim 23 characterised in that it comprises means containing one or more agents for treating ambient gaseous pollutants, in particular water vapour, to allow rapid purification of the gaseous atmosphere by removing them.

25. Closed unit according to claim 24 characterised in that in the particular case of removing water vapour, the internal drying means are in the form of an internal covering in the container and/or cap, of an insert placed inside the container and the cap, of the male part of the device, these drying means being produced from a thermoplastic polymer composition containing the treatment agent.

26. Closed unit according to claims 24 or 25 characterised in that in the particular case of removing water vapour, the treatment agent is chosen from the group that consists of silica gels, molecular sieves and clays.

27. Closed unit according to either claim 24 or claim 25 characterised in that, when the drying treatment agent is used in a powdery or compacted form, said treatment agent is placed in a specific recess situated at the bottom of the container or the bottom of the cap.

28. Closed unit according to at least one of claims 23 to 27 characterised in that, when treating gaseous pollutants other than water vapour, treatment agents appropriate for treating each pollutant are used in said unit mixed with the drying agent.

29. Closed unit according to at least one of claims 23 to 27 characterised in that, in the case of treating gaseous pollutants other than water vapour, treatments appropriate for treating each pollutant are used in said unit separately from the drying agent, by open compartments being created in the appropriate recess, dividing said recess into sectors enabling a plurality of mutually compatible treatment agents or mixtures of treatment agents to be received separately, or else to have the form of prepared compacted pellets, based on the treatment mixture.

30. Closed unit according to at least one of claims 24 to 29 for packaging and dispensing shaped objects singly, characterised in that they are produced from thermoplastic polymeric and/or copolymeric materials chosen from the group which consists of polyethylenes (PE), polypropylenes (PP), ethylene/propylene copolymers and mixtures thereof, polyamides (PA), polystyrenes (PS), acrylonitrile-butadiene-styrene copolymers (ABS), styrene acrylonitrile copolymers (SAN), polyvinylchlorides (PVC), polycarbonates (PC), polymethyl methacrylate (PMMA), polyethyleneterephthalates (PET) used individually or mixed depending on their compatibility.

31. Closed unit according to claim 30 characterised in that added to the thermoplastic polymeric and/or copolymeric materials is at least one natural or synthetic thermoplastic elastomer, the thermoplastic elastomer(s) being chosen from the group which consists of elastomers of the natural rubber type or synthetic rubber type, in particular olefin-based rubbers, in particular, isobutylene/isoprene polymers, ethylene-vinyl acetate (EVA), ethylene-propylene (EPR), ethylene-propylene-diene (EPDM), ethylene-acrylic esters (EMA-EEA), fluoropolymers, diene rubbers, such as, for example, polybutadienes, butadiene-styrene copolymers (SBR), rubbers based on condensation products such as, for example, thermoplastic polyester and polyurethane rubbers, silicones, styrene rubbers, styrene-butadiene-styrene (SBS) and styrene-isoprene-styrene (SIS).